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Examiners' Report
Principal Examiner Feedback

Summer 2024

Pearson Edexcel Level 3 Certificate
In Mathematics in Context (7MC0) Paper 2

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Introduction

It was pleasing to note that students appeared to be very well prepared for some of the topics that are beyond GCSE content and were able to access and attempt nearly all of the questions during this series. However, a small number of topics included in the specification, particularly content that should be familiar from GCSE Mathematics, was not always attempted well.

Topics students performed most successfully with included:

- Plotting and interpreting scatter graphs;
- Use of formulae;
- Growth and decay;
- Setting up and solving simultaneous equations.

Topics students found more challenging included;

- Completing Venn diagrams and use of set notation – interpreting and using to find probabilities;
- Drawing and interpreting histograms;
- Plotting line graphs to represent inequalities;
- Questions requiring explanations such as reliability of a result or stating assumptions.

The level of engagement with more familiar content, particularly content from the foundation tier of GCSE, appears to be at a consistent standard of work compared to that seen during the last session, with students not always appearing to be able to respond to questions that were set in a non-routine way successfully or not being able to take a creative approach to solving problems.

There is evidence to suggest students are relying on calculators to perform lengthy calculations, often involving more than one step, as calculations were not always shown clearly, systematically or at all. At times, figures stated suggested typing errors may have occurred for otherwise correct calculations, often leading to no marks being able to be awarded as intermediary calculations had not been written. Where working had been shown and follow through marks could be gained, the communication of results was not always clear and was occasionally ambiguous.

Questions that require evaluation, justification of mathematical reasoning or a conclusion-based comment relating to the method used, are still areas of weakness for students and should be addressed during teaching of the specification content. Centres should also give students an opportunity to revisit and practice topics from the GCSE specification, particularly content appearing on the Higher tier such as drawing graphs from equations or inequalities, completing and using more complex Venn diagrams and drawing and using histograms.

REPORT ON INDIVIDUAL QUESTIONS

Question 1

The majority of students were able to demonstrate a very good understanding of how to plot and use scatter graphs in this opening question. Full marks were often awarded in: part (a) - for plotting points; part (b) - when describing a relationship (either by stating the type of correlation or using the variable to give a valid description); part (c)(i) acknowledging the need to identify a potential outlier and doing so successfully; and estimating by using a line of best fit or other valid method in part (c)(ii). It is worth noting that a line of best fit was rarely drawn and so an answer given outside of the acceptable range often gained no credit.

Part (c)(ii) required students to identify that their estimation was valid due to being within the data range and write a comment on the reliability based on this. Many simply stated that it was only an estimate and therefore unreliable and so didn't gain the mark.

The final part of this question required students to use knowledge about response (or dependent) variables to explain how two theories about one variable being dependent on the other could be correct. Success in this part was variable. When the mark was awarded, the explanation was often very clear in giving reasons why bees and flowers may be dependent on one another. A common incorrect answer either referred to the correlation being the reason they are dependent on one another or that both can be measured which was an inacceptable answer.

Question 2

Part (i) was answered well by the majority of students. Some students opted to use an approach similar to finding the n^{th} term of a sequence, whilst others opted to use a simultaneous equation method. Both techniques frequently obtained the correct answer. In cases where full marks were not awarded, partial credit was often given for stating an equation or two that could be used to find the missing coefficients. Occasionally, some students had A and B the wrong way round. The majority of errors came from incorrect rearrangement when trying to solve for B once A had been found.
In part (ii), students could gain full follow through following their values of A and B. Those who gained full marks in part (i) and those who found incorrect values often gained full marks in this part as well. The vast majority of students not gaining any credit had often not been able to find a value for one or both of A and B in part (i) so did not know how to proceed.

Question 3

This small problem required students to use knowledge of decay or depreciation to find a solution in a context and was answered very well. Most students correctly identified '10 years' and were successful when using the multiplier method or opting to solve by listing the terms by year but were often slightly less successful. Unsuccessful methods included not compounding the percentage change or using an incorrect decimal multiplier.

Question 4

The final question in Section A required students to apply knowledge of risk to identify the most profitable way to sell honey. It was disappointing to note that success in this content area was not as expected, compared to previous sessions, as the probabilities given in the table were often not used meaning no credit could be given. Of the students who attempted this question, many gained at least 2 marks for working fully with one of the options and often this was for the option of selling the honey himself. The third mark for working with both options was often not awarded, often due to the common misconception that the one-off payment of £70 should be added to each type of summer or not seeing the need to total their values. This skill is beyond the GCSE specification and is therefore unfamiliar to previous learning. As such, centres should give students ample opportunity to practice questions involving risk as it involves learning a routine procedure.

Question 5

The opening question of Task 1 in section B assessed students' ability to use a range of probability skills relating to Venn diagrams and set notation. Part (a)(i) was answered well with for giving a valid description or for stating that the two events were mutually exclusive which was an acceptable alternative answer and gained credit. Part (a)(ii) was answered less successfully than part (i), with the most common error being to ignore the complement sign on *W*. Many students knew that it represented male trout but couldn't link that they also had to have a weight greater than 1kg, instead giving an incorrect description such as male and all trout over 1kg. Using set notation to represent the shaded region in part (a)(iii) was poorly attempted, with very few correct responses seen. A wide variety of incorrect answers were seen, including mixing up union and intersect signs and mixing up shaded and unshaded regions.
Students' ability to complete a complex Venn diagram was assessed in part (b) and the majority of students gained at least 2 of the 4 marks available, with many awarded full marks. The most common error was to not include the value 228 in the outer region.

Part (c) assessed students understanding of probability notation, most of which should be familiar from GCSE content, with the first two parts being answered generally well and many also being able to gain marks from using their incorrect values from their Ven diagram. The majority of students, however, found the more complex given that notation to be too challenging. Whilst partial marks were often awarded, a larger than expected number of students gained no credit as they only stated the values from the Venn diagram rather than giving a fraction, decimal or percentage to represent the probabilities.

Question 6

This question was designed to assess students' ability to use frequency tables to draw and interpret histograms, skills that should be familiar following GCSE learning on the higher tier.
Part (a) was often poorly attempted with many gaining no marks due to drawing a bar chart instead of using frequency density. Of the students who correctly began by calculating frequency densities, the majority drew a fully correct histogram to gain all four marks available or correctly calculated all five frequency densities to gain three of the marks. Some calculation errors were occasionally seen as were histograms with only three correctly drawn bars due to often misinterpreting what each 2mm square represented on the scale for the intervals not starting on a major gridline.

Parts (b) and (c) were attempted with varying levels of success. Students gaining full marks in part (a) were not always able to use either the frequency table or their histogram to calculate an estimated probability in part (b) or estimate the ratio in part (c), with a larger than expected number being blank. However, it was pleasing to note that a larger than expected number of students were able to gain all the marks available in part (b) and part (c) even if they gained no marks in part (a), demonstrating that they could use the information in the frequency table given to solve problems in an alternative way.

When students identified that to answer part (b) they needed to combine the frequencies from certain groups, some often gained full credit for recognising that a proportion of one group needed to be added to two complete groups and calculated correctly but the majority only gained one mark for adding two correct frequencies to an incorrect proportion which was often assuming the 150 to 230 mm group was to be split into thirds.

A similar error occurred in part (c) with partial credit being awarded to responses where one proportion was calculated correctly but the other proportion was not, with (1-fraction) commonly used. Some students wrote the final answer as fractions instead of as a ratio and some also did the ratio of bass between 180mm and 260mm to the ratio of bass not between 180mm and 260mm instead of the total.

Question 7

Most students answered part (a)(i) correctly and identified the correct constant difference. However, stating an assumption in part (a)(ii) was answered less well with very few students recognising that the rate of increase needed to remain 300 million per year and many stating just one alone which was insufficient. Other frequently seen incorrect answers included that the number of plastic bags given away would continue to increase. Some students referenced other external factors or other distribution platforms besides supermarkets and rarely gained credit. There was no requirement for 'million' in this part of the question and students were not penalised for incorrect conversions.

Part (b) required students to use the model to find the number of bags in a single year and then a total across a period of time either by repeated addition or by using the sum of a series formula in the source booklet. Part (b)(i) was answered well by the majority of students, with some gaining both of the marks for following through using their value of *d* from (a). Part (b)(ii) was answered less well. Of those who were successful, students often preferred to list and then add individual terms rather than use the more efficient summing formula and those who chose to use the formula and did not get both marks often substituted an incorrected value.

Part (c) was answered well by the vast majority of students with many calculating the correct income from single-use plastic bags. Incorrect answers were often due to finding 80% instead of 8% or decreasing by 8%. There was a requirement for 'million' in this part of the question and some students didn't gain the accuracy mark due to the inaccurate magnitude.

A range of approaches could be used to solve the multi-step problem in part (d) and many of these approaches were seen being used with varying levels of success. Whilst many students recognised the need to use the fraction, use the weight of a single bag and find a difference, which could be done in any order, some were unable to combine all three elements in a systematic way to find both the actual and the expected weights. Frequent incorrect answers included an incorrect conversion between grams and kilograms. Some students failed to find the fraction for both actual and expected.

Question 8

Showing that given information could be represented by the given inequality in part (i) appeared to be fairly challenging for a large number of students, often gaining only one mark due to not showing full calculations to fully justify the result. However, those recognising what to do often showing the required inequality correctly to gain full credit. Occasionally, students that did not gain full marks only considered the plastic bags for one year or did not use the information about the weight of each bag. Another commonly seen incorrect response involved the substitution of figures into the inequality to try and solve or and simply trying to solve to find *n*.

Part (ii) was often answered well regardless of the attempt made in part (i) as the formula was provided and many students identified they simply needed to substitute values and evaluate. When only one of the two marks available were awarded, it was often due to not finding the maximum number of bags that could have been sold and instead giving a decimal value, a rounded-up value or an answer embedded in an inequality.

Question 9

This last question of task 2 required students to solve a problem involving the mean with other constraints and was answered very well by the majority. A very small number incorrectly chose to multiply by 10 instead of divide by 10 for their initial step due to misinterpreting the 10 times greater constraint and a very small number of students were not awarded the final mark due to either omitting the millions from their final answer or incorrectly writing in full the 56.55 million before calculating or their answer of 493 million and therefore not having an answer with correct magnitude.

Question 10

It was very pleasing to see a much larger than expected number of students attempt this question with greater success than on previous sessions. Students were required to set up and solve simultaneous equations from information given in words, a skill that should be partly familiar from GCSE Maths content. Whilst many students gained all six marks available, some gained partial marks, often for writing suitable equations initially and attempting to solve with an error often occurring when trying to eliminate the first variable but then being able to follow through and calculate a total cost using their found values.

Many students showed very little working beyond writing the initial equations and substituting found values to find a total cost, presumably using their calculators to find solutions, which is acceptable and gained full marks if an accurate answer was shown. However, students should be warned that a typing error on the calculator that produces an incorrect value may lead to method marks not being awarded. A small number of students showed that they knew they needed to create equivalent equations to be able to eliminate a variable but unfortunately chose to add rather than subtract when trying to eliminate the y variable. When students failed to gain any credit, it was often due to trying to solve just one equation at a time incorrectly or attempting to use trial and improvement which gains no credit unless accurate values are found. This was rarely seen compared to previous sessions though.

Question 11

The final question on this paper assessed the linear programming content area of the specification and contains content which many students find the most challenging in every exam session. It was, however, pleasing to see that the vast majority of students attempted every part of this question compared to last year, with a greater level of success being achieved.

Responses in part (a)(i) were generally very clear when students correctly tried to form inequalities from the information given and then manipulate to the required format. When students gained no credit, it was often due to trying to solve the inequalities either individually or simultaneously. Very few students were able to correctly interpret the third constraint in context, with the majority giving the description for a strict inequality rather than a complete description whilst a small number confused the definitions of x and y variables.

Part (b) was answered less well. Whilst a small number wrote two fully correct inequalities and some were able to gain a mark for correct values with incorrect inequality symbols or show one constraint correctly, many were not being able to write the equation of the two lines shown on the grid as inequalities at all and blank responses were more frequent than expected. As a prior GCSE Higher tier skill that should be familiar, this was disappointing given that at least one mark should have been achieved for writing the equations of the simple straight lines at the very least.

Drawing the constraints on the grid to find the feasible reason was a challenge for most with only the more able students being able to gain full marks. Again, as this skill should be familiar from the GCSE specification and is a routine procedure on this specification, learners should be able to have a greater level of success. However, greater success was demonstrated when answering part (d), with many students gaining at least one mark for correctly testing one of their vertices and a second mark was often also awarded for finding accurate sales for their vertex tested. It was also pleasing to note that other methods were used to calculate a fully correct answer without using the grid and vertex method, meaning students gaining no marks in part (c) were not automatically excluded from gaining credit in part (d).

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